

C-A OPERATIONS PROCEDURES MANUAL

8.1.6 Cavity RF Systems Turn On

Text Pages 1 through 4

Hand Processed Changes

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Revision No. 00

Approved: _____
AGS Department Chairman Date

8.1.6 CAVITY RF SYSTEMS TURN ON

1. Purpose

To provide instructions for linac staff on how to turn on the linac accelerating cavity RF systems.

2. Responsibilities

Trained linac staff can turn on the cavity RF systems.

3. Prerequisites

- 3.1 The accelerating cavities must be under good vacuum ($< 2 \times 10^{-6}$ Torr).
- 3.2 The linac tunnel must either be secured for beam or cleared for RF before RF can be put into the cavities.
- 3.3 The Linac Operations Coordinator should be consulted prior to turn on, and should be informed of any problems during turn on which could lead to significant delays.
- 3.4 Qualified and trained Linac staff.

4. Precautions

The crowbar systems for the 7835, primary and redundant, and the 4616 should be tested during the yearly maintenance, as well as after a crowbar system repair has been made. A sticker by each crowbar test point will indicate the date of the last test. Do not turn on the RF system unless the crowbars for that system have been tested within the previous 12 months.

5. Procedure

- 5.1. Check that all 480 VAC power plugs are in each cabinet. Check that all cabinet doors are closed and locked (Kirk key system).
- 5.2. Turn on the main 480 VAC disconnect switches:
 - A. FDS MOD 1-3, located between Mod 2 CCA and Mod 3 driver.
 - B. FDS MOD 4-6, located between Mod 6 CCA and Mod 7 driver
 - C. FDS MOD 7-9, located after Mod 9 CCA.
- 5.3. Turn on the main 208 VAC disconnect switch. (Located at each Local Control Station (LCS) in the breaker box in the leftmost rack).
- 5.4. Turn on all plug-in breakers on the wall:
 - A. Driver
 - B. Power Ampere.
 - C. Modulator
 - D. Cap Bank
 - E. CCA
- 5.5. Turn on the 480 VAC cabinet breakers. All cabinet blowers should come on

- 5.6. Check to see that the low level drive RF system is on and pulsing. This system is located in the rightmost rack in Mod 1 LCS (rack A11). The "Master Oscillator", and two solid state amperes should be on. One should measure a 1.4 V pulse on the "Low Level Drive" output in the RF Monitor panel.
- 5.7. Clear the "Local Lock" on the Master Filament turn on chassis. If there is a "Remote Lock", this must be cleared from the Linac Control Room (LCR), rack F6.
- 5.8. At the 4616 Driver cabinet:
 - A. If there is no malfunction indicated on the filament turn on switch, clear the local lock and turn on the 4616 filament.
 - B. Check that 6.3 VAC is showing on the 7651 filament meter.
 - C. Check that 120 V is showing on the 7651 grid bias meter.
 - D. The 4616 filament current should be rising to 470 A. Within 2 minutes, the red "ON" light in the Driver AC Logic bucket should come on.
- 5.9. At the Power Amplifier Filament cabinet:
 - A. Check that the filament "Auto/Manual" switch is in Auto.
 - B. If there is no malfunction indicated on the filament turn on switch, clear the local lock and turn on the 7835 filament.
 - C. The voltage and current should begin rising smoothly. Within 5 minutes, the voltage should stop at 4.7 V and the current should stop at 6,800 A. The "on" light should come on.
- 5.10. At the Modulator cabinet:
 - A. If there is no malfunction indicated on the filament turn on switch, clear the local lock and turn on the modulator filaments.
 - B. Push the reset button on the modulator SCR control bucket.
 - C. From the SCR control bucket, check that the grid deck voltage is rising to 110 VAC, the LPT filament current should rise to 190 A, and the 8618 filament current should rise to 310 A.

Within 3-5 minutes, the "on" light should come on the the Modulator AC Logic bucket.

- 5.11. With the cabinet doors closed, and the grounding switch in the live position, the CCA is ready to run. In the Master Filament bucket in the LCS, there should be a red "on" light for the CCA. All the red filament "on" lights should be lit for each module, and the "Master On" light should be lit on the Master Filament bucket. Any malfunctions will be indicated by a light, and must be corrected.
- 5.12. The 4616 HV turn on switch is located in the Driver HV Logic bucket. If a malfunction is indicated on this switch, then check the system indicated by the corresponding individual malfunction light. When there is no malfunction, clear the Local Lock and turn on the supplies. If there is a Remote Lock, this must be cleared from the LCR. Once the Driver HV is turned on, check the following:
 - A. The 7651 Screen Grid comes to 600 V
 - B. The 7651 Anode comes to 4.5 kV
 - C. The 4616 Bias comes to 2 kV
 - D. The 4616 Anode comes to about 17 kV

- 5.13. In the General Purpose Pulse Delay bucket at the LCS, the "RF Malf - Amplitude" light should be blinking. (This is checked to show that the malfunction is working).
- 5.14. Check to see that the Tank 1 and Tank 9 gates are closed, and the tunnel is either cleared for RF or secured for beam.
- 5.15. If no malfunction is indicated on the pulsing turn on switch (in the Pulsing Turn on bucket), then clear the Local Lock and turn on pulsing. If there is a Remote Lock, it must be cleared from the LCR. (If the linac tunnel is not secured or cleared for RF, that also will generate a Remote Lock on the pulsing turn on switch). Once pulsing is turned on, the red "on" light will come on, and the 4616 will be running. At this point, the following signals should be checked:
- A. The 4616 input forward power should be ≈ 3 V ("4616 input F" on the Signal Monitor Panel).
 - B. The 4616 input reverse power should be < 0.5 V ("4616 input R" on the Signal Monitor Panel).
 - C. The Driver Fwd Pwr (on Pulsing Logic bucket) should be ≈ 7 V.
 - D. The Driver Rev Pwr (on Pulsing Logic bucket) should be < 0.5 V.
 - E. The 4616 screen voltage ("Screen Mod Vol" in Pulsing Turn on bucket) should be ≈ 8 V.

If any of the above signals are not proper, the 4616 should be tuned.

- 5.16. Check to see that all the RF DACAD numbers are set to their last saved values (AGAST file MODx to check RF setting of Tank x).
- 5.17. At the LCS, lower the voltage control pot on the "60 kV SCR Controller" to zero, put the Local/Remote switch to Local, and push the reset button.
- 5.18. Push the 60 kV SCR Controller "Rectifier on" button.
- A. In the Master HV bucket, all the "HV Vac Contactor" (Jennings) lights should go out, and the red Master HV on light should be lit.
 - B. The red "Rectifier on" light on the 60 kV SCR Controller should be on.
- 5.19. With the power amp forward and reverse powers displayed on a scope, slowly raise the 60 kV voltage control pot ("DC Volts" in the SCR controller). The digital readback voltage should start to rise, and the fwd. and rev. power waveforms should appear on the scope. Continue raising the HV until you reach 30 kV. If at any point the reverse power starts to break up, lower the HV until the sparking stops. (Check the 7835 and feedloop matches, and tune as necessary). Then continue trying to bring the HV up to 30 kV.

5.20. If all the malfunction lights go out, the RF system is ready to run. If a malfunction light remains on, check the following LCS monitors:

- A. The tank probe should be 0.2 V peak in amplitude, at the correct Gradient Detector Bias (slideback).
- B. The fast phase loop should be nulled.
- C. The Ref. tank phase loop should be nulled.
- D. "Driver Rev Pwr" in the Pulsing Logic bucket should be < 1V.
- E. Power Ampere Rev Pwr should be < 1V.
- F. Low energy loop rev pwr should be < 0.5 V.
- G. High energy loop rev pwr should be < 0.5 V.

5.21. If the RF system cannot be brought up to correct power levels, consult with the Linac Operations Coordinator concerning the possible need for tube replacement.

5.22. When all rf systems have been brought on, inform the Linac Operations Coordinator.

6. Documentation

None

7. References

None

8. Attachments

None